Claims

1. A process for producing a fibrous material having a modified structure comprising a lignocellulosic material with phenolic or similar structural groups and a modifying agent, said process comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material, and
- contacting the oxidized fibre material with a modifying agent containing at least one first functional portion, which is compatible with the oxidized fibre material, said modifying agent being capable of providing the lignocellulosic fibre material with properties foreign to the native fibre.

2. The process according to claim 1, wherein the lignocellulosic fibrous matrix is reacted with an oxidizing agent in the presence of a substance capable of catalyzing the oxidation of phenolic or similar structural groups by said oxidizing agent.

3. The process according to claim 1 or 2, wherein the modifying agent is activated with an oxidizing agent.

4. The process according to claim 1, wherein the modifying agent is selected from the group of hydrophobic agents, whitening or (colour retention agents), signal agents, active gas traps, antimicrobial compounds, colouring agents, pigments, agents capable of dissipating incident radiation, sizing agents, retention agents, or one carrying several of these properties.

5. A process for producing a fibre material having a modified structure comprising a lingo cellulosic fibrous matrix with phenolic or similar structural groups and a modifying agent, said process comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material, and
- contacting the oxidized fibre material with a modifying agent containing at least one first functional portion, which is compatible with the oxidized fibre material, and at least one second portion having new functional properties in order to provide a lignocellulosic fibre material exhibiting properties foreign to the native

fibre.

6. The process according to claim 5, wherein the lignocellulosic fibrous matrix is reacted with an oxidizing agent in the presence of a substance capable of catalyzing the oxidation of phenolic or similar structural groups by said oxidizing agent.

7. The process according to claim 5, wherein the modifying agent comprises at least one functional group, which bonds to the oxidized lignocellulosic matrix, and a hydrocarbon tail, which is saturated or unsaturated.

8. The process according to claim 5, wherein the hydrocarbon tail contains a minimum of two, preferably at least three carbon atoms, and extends to up to 30 carbon atoms, in particular 24 carbon atoms.

9. The process according to claim 5 or 6, wherein the second groups comprises a group capable of carrying or capable of being modified for carrying a negative or positive charge.

10. The process according to claim 5 or 6, wherein the second groups comprises a group capable of carrying or capable of being modified for antibacterial, antifungal or antimicrobial effect.

11. The process according to claim 5 or 6, wherein the second groups comprises a group capable of carrying or capable of being modified for heatproof, flame-retardant or UV-resistant

12. The process according to claim 5 or 6, wherein second groups comprises a group capable of carrying or capable of being modified for conductive, antistatic, insulative character or is acting as a sensor

13. The process according to claim 5 or 6, wherein the second groups comprises a group capable of carrying or capable of being modified for changing the colour of the fibre.

14. The process according to claim 5 or 6, wherein the second group comprises properties that participate in developing colour.

15. The process according to claim 5, wherein the modifying agent is selected from the group of betuline, betulinol, kaempherol and quercetin or their derivatives or structural analogues

16. A process for producing a fibre material having a modified structure comprising a lingocellulosic fibrous matrix having phenolic or similar structural groups and a modifying agent, said process comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material,
- contacting the oxidized fibre material with a modifying agent containing at least one first functional group, which is compatible with the oxidized fibre material, and at least one second functional group in order to provide a lignocellulosic fibre material having a modified surface,
- contacting the lignocellulosic fibre material with a functional agent, and
- bonding a functional agent to the modified surface of the fibre material in order to impart to the fibre material new functional properties, foreign to the native fibre, derivable from the functional agent.

17. The process according to claim 16, wherein the lignocellulosic fibrous matrix is reacted with an oxidizing agent in the presence of a substance capable of catalyzing the oxidation of phenolic or similar structural groups by said oxidizing agent.

18. The process according to claim 17, wherein the modifying compound is a bifunctional compound containing at least one first functional portion or group and at least one second functional group, the second functional group being selected from the group of hydroxyl (including phenolic hydroxy groups), carboxy, anhydride, aldehyde, ketone, amino, amine, amide, imine, imidine and derivatives and salts thereof.

19. The process according to any of claims 2 to 4, 6 to 15 and 17 or 18, wherein the substance capable of catalyzing the oxidation of phenolic groups is an enzyme.

20. The process according to claim 19, wherein the enzyme capable of catalyzing the oxidation of phenolic or similar structural groups is selected from the group of peroxidases and oxidases.

21. The process according to claim 20, wherein the enzyme is selected the group of laccases (EC 1.10.3.2), catechol oxidases (EC 1.10.3.1), tyrosinases (EC 1.14.18.1), bilirubin oxidases (EC 1.3.3.5), horseradish peroxidase (EC 1.11.1.7), manganase peroxidase (EC1.11.1.13), lignin peroxidase (EC 1.11.1.14), hexose oxidase (EC 1.1.3.5), galactose oxidase (EC 1.1.3.9) and lipoxygenase.(EC 1.13.11.12).

22. The process according to claim 20 or 21, wherein the enzyme dosage is from 1 to 100,000 nkat/g, preferably 10-500 nkat/g, and it is employed in an amount of 0.0001 to 10 mg protein/g of dry matter.

23. The process according to any of claims 2 to 4, 6 to 15 and 17 to 22, wherein the oxidizing agent is selected from the group of oxygen and oxygen-containing gases, such as air, or hydrogen peroxide.

24. The process according to claim 23, wherein oxygen or oxygen-containing gas is introduced into the aqueous slurry during the reaction.

25. The process according to any of the preceding claims, wherein the reaction of step (a) is carried out in an aqueous or dry phase at a consistency of 1 to 95 % by weight of the fibre material.

26. The process according to any of the preceding claims, wherein the reaction is carried out at temperature 5 – 100 °C.

27. The process according to any of the preceding claims, wherein the reaction is carried out on a fibrous web.

28. The process according to claim 1, wherein the lignocellulosic fibre material is reacted with a chemical oxidizing agent capable of catalyzing the oxidation of phenolic or similar structural groups to provide an oxidized fibre material.

29. The process according to any of claims 2 to 4, 6 to 15 and 17 or 18, wherein the chemical

oxidizing agent is hydrogen peroxide, Fenton reagent, organic peroxidase, potassium permanganate, ozone and chloride dioxide, ammoniumpersulphate (APS) or an inorganic transition metal salts.

30. The process according to any of claims 1, 5 or 16, wherein radical forming radiation capable of catalyzing the oxidation of phenolic or similar structural groups is used to provide an oxidized fibre material.

31. The process according to any of the preceding claims, wherein the reaction steps are carried out sequentially or simultaneously.

32. A method of producing white-coloured fibres from a raw-material comprising a lingocellulosic fibrous matrix, the method comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material, and
- contacting the oxidized fibre material with a whitening agent containing at least one first functional portion, which is compatible with the oxidized fibre material, said whitening agent being capable of providing the lignocellulosic fibre material with white colour.

33. The method according to claim 31, wherein the whitening agent is an organic substance, which is capable of rendering the fibre a white colour.

34. The method according to claim 32, wherein the whitening is selected from betuline, betulinol, kaempherol and quercetin or their derivatives or structural analogues.